ES7154

24-bit I²S Audio DAC with 2 Vrms Output

GENERAL DESCRIPTION

The ES7154 is a low cost 14-pin stereo digital to analog converter. The ES7154 can accept I²S serial audio data format up to 24-bit word length. The device uses advanced multi-bit Δ-∑ modulation technique to convert data into two channel analog outputs. The multi-bit Δ-∑ modulator makes the device with very low sensitivity to clock jitter and very low out of band noise.

The devices integrates a charge pump to generate negative supply from 5V supply, thus providing ground centered 2 Vrms analog output.

FEATURES

- 102 dB SNR
- -85 dB THD+N
- Up to 100 kHz sampling frequency
- I^2S audio data format, 16-24 bits
- Single power supply 4V to 5.25V
- Support non standard audio clocks like 25 MHz or 26 MHz

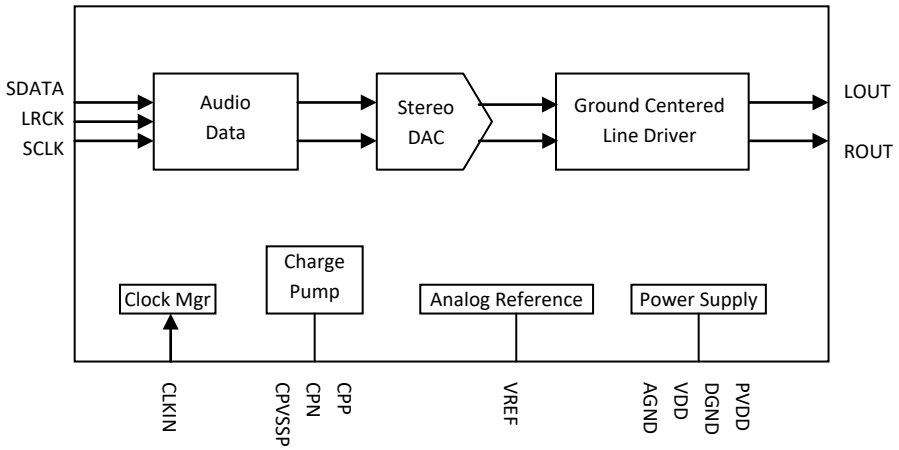
APPLICATIONS

- OTT
- STB
- Digital TV
- DVD player

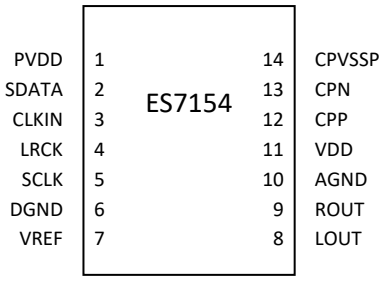
ORDERING INFORMATION

ES7154 -40°C ~ +85°C
SOIC-14

1. BLOCK DIAGRAM

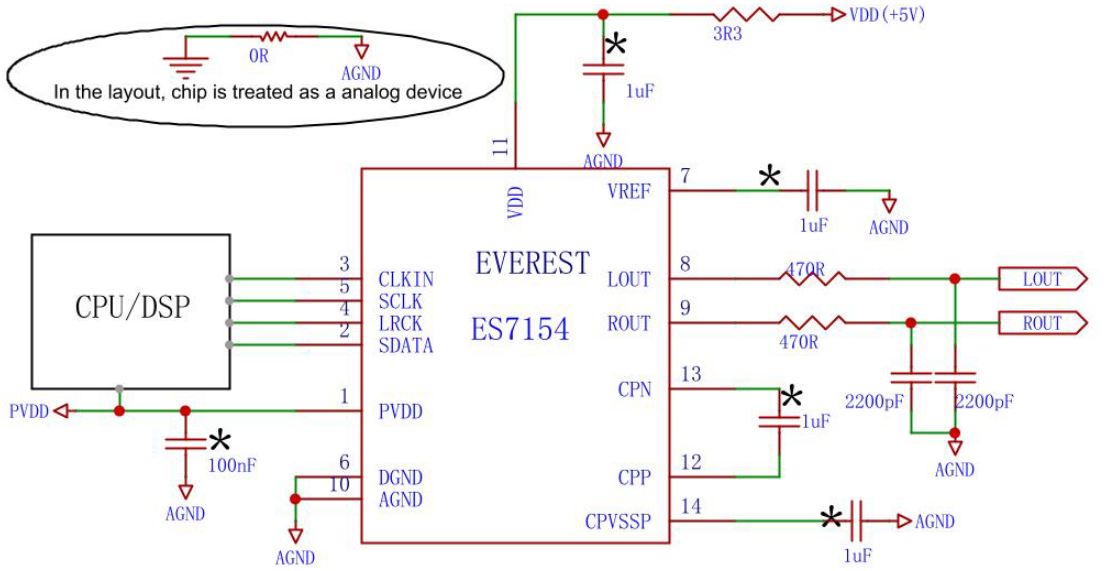


2. PIN OUT AND DESCRIPTION



PIN	NAME	I/O	DESCRIPTION
1	PVDD	Supply	Digital IO supply
2	SDATA	I	Audio data
3	CLKIN	I	Master clock
4	LRCK	I	Audio data left and right clock
5	SCLK	I	Audio data bit clock
6	DGND	Supply	Digital ground
7	VREF		Decoupling capacitor
8	LOUT	O	Left analog output
9	ROUT	O	Right analog output
10	AGND	Supply	Analog ground
11	VDD	Supply	Power supply
12	CPP		Charge pump capacitor top
13	CPN		Charge pump capacitor bottom
14	CPVSSP		Charge pump filtering

3. TYPICAL APPLICATION CIRCUIT



* For the best performance,decoupling and filtering capacitors should be located as close to the device package as possible

Note: Capacitor at CPVSSP pin must be 1uF.

4. CLOCK MODES AND SAMPLING FREQUENCIES

According to the sampling rate, the device can work in two speed modes, single speed and double speed. Table 1 lists the typical clock modes supported by the device.

Table 1 Speed Mode and CLKIN/LRCK Ratio

MODE	Sampling Rate	CLKIN/LRCK Ratio
Single Speed	8kHz – 50kHz	32, 64, 128, 192, 256, 384, 512, 768, 1024
Double Speed	84kHz – 100kHz	128, 192, 256, 384, 512, 768, 1024

5. DIGITAL AUDIO INTERFACE

The ES7154 can accept I²S serial audio input data from 16-bit to 24-bit. The device can detect the data word length automatically. The relationship of SDATA, SCLK and LRCK for the format is illustrated through Figures 1.

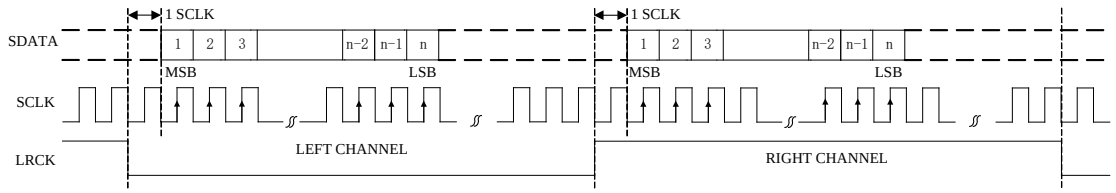


Figure 1 I²S Serial Audio Data Format Up To 24-bit

6. POWER UP AND DOWN

Upon applying VDD, the device will reset itself and enter power down state. During this state, the device clamps outputs to ground and power down the operation except for clock management unit. During power up, with stable CLKIN, applying at least 5120 continuous LRCK (107 ms for 48 kHz LRCK), the device will leave power down state and enter normal operation.

During normal operation, continuous LRCK and CLKIN must be applied.

Power down can be achieved by removal of VDD, or stopping LRCK first, at the same time keeping at least 4096 continuous CLKIN, and finally stopping CLKIN.

7. ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS

Continuous operation at or beyond these conditions may permanently damage the device.

PARAMETER	MIN	MAX
Supply Voltage Level	-0.3V	+5.25V
Input Voltage Range	DGND-0.3V	PVDD+0.3V
Operating Temperature Range	-40°C	+85°C
Storage Temperature	-65°C	+150°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	MIN	TYP	MAX	UNIT
VDD	4	5	5.25	V
PVDD	1.6	1.8/3.3	5.25	V

DAC ANALOG AND FILTER CHARACTERISTICS AND SPECIFICATIONS

Test conditions are as the following unless otherwise specify: VDD=5V, PVDD=1.8V, AGND=0V, DGND=0V, ambient temperature=25°C, Fs=48 KHz, MCLK/LRCK=256.

PARAMETER	MIN	TYP	MAX	UNIT
DAC Performance				
Signal to Noise ratio (A-weigh)	95	102	105	dB
THD+N	-88	-85	-80	dB
Channel Separation (1KHz)	80	85	90	dB
Interchannel Gain Mismatch		0.05		dB
Filter Frequency Response – Single Speed				
Passband	0		0.4535	Fs
Stopband	0.5465			Fs
Passband Ripple			±0.05	dB
Stopband Attenuation	40			dB
Filter Frequency Response – Double Speed				
Passband	0		0.4167	Fs

Stopband	0.7917			Fs
Passband Ripple			±0.005	dB
Stopband Attenuation	40			dB
Analog Output				
Full Scale Output Level	1.8	2	2.1	Vrms

POWER CONSUMPTION CHARACTERISTICS

PARAMETER	MIN	TYP	MAX	UNIT
Normal Operation Mode				
PVDD=1.8V, VDD=5V		35		mA
Power Down Mode				
PVDD=1.8V, VDD=5V		2		mA

SERIAL AUDIO PORT SWITCHING SPECIFICATIONS

PARAMETER	Symbol	MIN	MAX	UNIT
MCLK frequency			51.2	MHz
MCLK duty cycle		40	60	%
LRCK frequency			100	KHz
LRCK duty cycle		40	60	%
SCLK frequency			26	MHz
SCLK pulse width low	TSCLKL	15		ns
SCLK Pulse width high	TSCLKH	15		ns
SCLK falling to LRCK edge	TSLR	–10	10	ns
SCLK falling to SDOUT valid	TSDO	0		ns
SDIN valid to SCLK rising setup time	TSDIS	10		ns
SCLK rising to SDIN hold time	TSDIH	10		ns

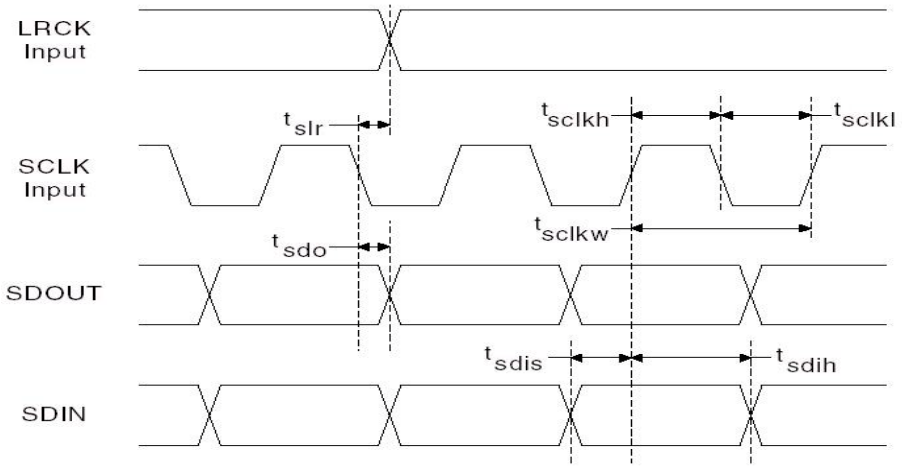
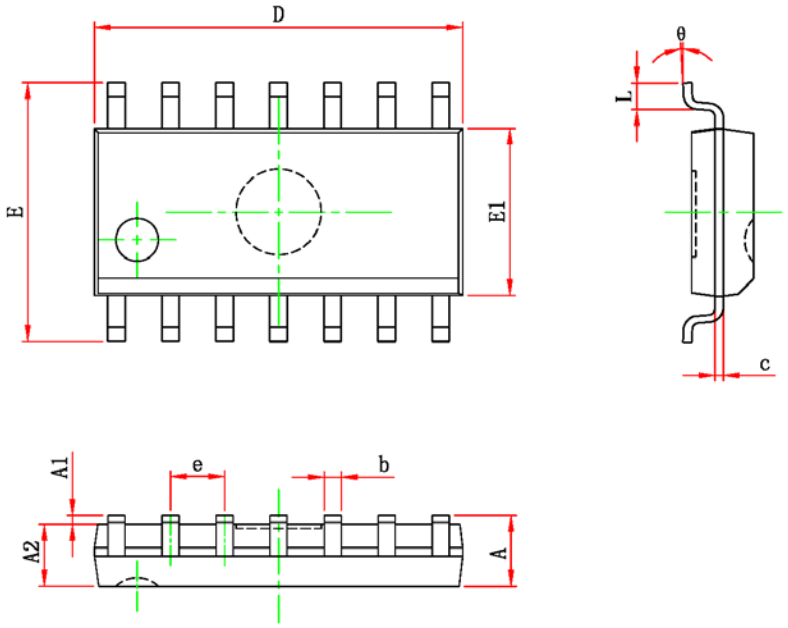


Figure 2 Serial Audio Port Timing

8. PACKAGE

SOP14 (150mil) PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	——	1.750	——	0.069
A1	0.100	0.250	0.004	0.010
A2	1.250	——	0.049	——
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

9. CORPORATE INFORMATION

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